

VIRGINIA DEPARTMENT OF TRANSPORTATION
TRAFFIC ENGINEERING DIVISION
INSTRUCTIONAL & INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Traffic Signals		NUMBER: IIM-TE-378
		SUPERSEDES: None
SPECIFIC SUBJECT: High Visibility Signal Backplates (HVSBS)		DATE: April 22, 2016
		SUNSET DATE: None
DIRECTED TO: Regional Operations Engineers/Directors Regional Traffic Engineers Regional Operations Maintenance Managers State Location & Design Engineer District Location & Design Engineers District Transportation & Land Use Directors		APPROVAL: / original signed by/ Raymond J. Khoury, P.E. State Traffic Engineer Richmond, VA Approved April 22, 2016

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PURPOSE AND NEED

This memorandum is presented to establish standards and guidelines for installing HVSBs on new and existing highway traffic signals. Except as identified under the conditions herein, when signals are constructed, rebuilt, or modified, HVSBs shall be used on signals located on the primary highway system and may be used on signals located on the secondary highway systems.

The Federal Highway Administration (FHWA) has identified High Visibility Signal Backplates (HVSBs) as one of the nine proven safety countermeasures.¹ Research has shown they are a low cost improvement that can reduce crashes at signalized intersections by 15 percent² and reduce fatal and injury crashes at signalized intersections by 29 percent.³

Backplates are added to signal faces to improve its visibility by introducing a controlled-contrast background. The signal face can be made more conspicuous by framing the backplate with a retroreflective border. HVSBs, backplates with retroreflective borders, provide enhanced signal visibility by:

- Introducing retroreflective material that contrasts against the dark backplate
- Distinguishing the signal face assembly from background lighting, signs, and visual distractions
- Increasing signal face recognition during power outages and times of limited visibility (e.g. night, fog, heavy precipitation)
- Drawing attention to the intersection and signals after a long roadway section without signals.

Attachments A and B contain the background and technical aspects of HVSB implementation, respectively.

EFFECTIVE DATE

Future projects and contracts: This Memorandum shall be effective for all projects, contracts, and RFPs (including signal maintenance contracts, Design-Build and Public-Private Transportation Act (PPTA)) issued for advertisement or released on or after November 1, 2016. This IIM should be considered for all projects and contracts advertised before that date.

Land use permit for private developments: This Memorandum shall be effective for all projects where the signal design has not been submitted to VDOT, and may be applied to permit projects currently under VDOT review, if feasible to do so, as agreed to by VDOT and the permittee. This Memorandum should be applied to previously approved permits if agreed to by the permittee.

¹ http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_007.cfm

² Miska, E., P. de Leur, and T. Sayed. "Road Safety Performance Associated with Improved Traffic Signal Design and Increased Signal Conspicuity." ITE, 72nd Annual Meeting, Philadelphia, PA. Washington, DC, 2002

³ El-Basyouny, K. and Sayed, T. "A full Bayes multivariate intervention model with random parameters among matched pairs for before-after safety evaluation." Accident Analysis and Prevention, Vol. 43, No. 1, Oxford, N.Y., Pergamon Press, (2011) pp. 87-94.

Existing projects and contracts: This Memorandum may be applied to signals constructed or modified under existing contracts (including existing construction projects, Regional Traffic Signal Construction contracts, and Regional Traffic Signal Maintenance Contracts) if the change is approved by the VDOT Project Engineer.

RELATED CHANGES TO THE VIRGINIA SUPPLEMENT TO THE MUTCD

This memorandum makes the following changes to the 2011 Virginia Supplement to the MUTCD, Revision 1:

- Adds Standards for the installation of HVSBs at certain locations based on highway classification, roadway speed, and intersection sight distance.
- Adds Guidance for the installation of HVSBs at certain locations based on site-specific intersection characteristics.
- Adds an Option to use HVSBs at any traffic control signal, temporary traffic signal, emergency signal, portable signal, hybrid beacon, and intersection control beacon.
- Adds Options to omit HVSBs at otherwise required or recommended locations based on engineering judgment, aesthetic, and certain geometric conditions where HVSBs may not be appropriate.
- Establishes the size, color, and location of the retroreflective strip on a signal backplate.

These changes to the Supplement are shown below, and the complete Sections of the Supplement are provided in Attachments C through G to the memorandum.

Section 4D.12 Visibility, Aiming, and Shielding of Signal Faces

Section 4D.12 of the Supplement is modified to insert Paragraphs 20a through 20i immediately following Paragraph 20, revise Paragraph 21, and delete Paragraph 22 as shown below.

Support:

20a High visibility signal backplates are backplates with retroreflective borders that provide enhanced signal visibility by:

- Introducing retroreflective material that contrasts against the dark backplate,
- Distinguishing the signal face assembly from background lighting, signs, and visual distractions,
- Increasing signal face recognition during power outages and times of limited visibility (e.g. night, fog, heavy precipitation), and
- Drawing attention to the intersection and signals after a long roadway section without signals.

Option:

20b High visibility signal backplates may be used on traffic control signals.

Standard:

20c **If used, high visibility signal backplates shall consist of a 3-inch wide fluorescent yellow retroreflective strip along the outermost perimeter of the front face of a signal backplate.**

Support:

- 20d If used, it is desirable to install high visibility signal backplates on every signal face at the intersection.

Standard:

- 20e **If used on an approach, high visibility signal backplates shall be used on all signal faces facing that approach.**

Option:

- 20f High visibility signal backplates may be used on signal faces at an individual intersection and not at an adjacent intersection(s) along a corridor.

Standard:

- 20g **Except as provided in Paragraph 20i, high visibility signal backplates shall be used on signal faces at signalized intersections with at least one approach that has one or more of the following characteristics:**

- A. High speed roadway - where the posted or statutory speed limit or the 85th-percentile speed on an approach is 45 mph or greater;**
- B. Corridor of Statewide Significance (CoSS);**
- C. Principal arterial;**
- D. Intersections with limited sight distances to the signal face, per Table 4D.12 in this Supplement; or**
- E. Intersection at interchange and/or freeway ramp terminals.**

Guidance:

- 20h *Except as provided in Paragraph 20i, high visibility signal backplates should be used on signal faces at signalized intersections with at least one approach that has one or more of the following characteristics:*

- A. Where visual roadside clutter or the natural or manmade surroundings would distract road users' attention from the traffic control signal;*
- B. Where crash history (angle, rear end, or other) or known red light running could be correctable by the installation of high visibility signal backplates;*
- C. Is located in an area with known or frequent power outages, especially at locations without an Uninterruptible Power Supply (UPS); or*
- D. A location that is the first signal encountered after a long section of roadway without traffic control signals.*

Option:

- 20i Once an intersection or approach has been identified for high visibility signal backplate use, high visibility signal backplates may be omitted on any intersection approach that has one or more of the following characteristics:

- A. Streetscape corridor or location with decorative traffic signal poles;
- B. Skewed angles where high visibility signal backplates could inadvertently provide unwanted visibility for the wrong approach;
- C. Low-volume approach, such as a low-volume commercial entrance or private entrance (see Road Design Manual Appendix F for definitions), or secondary roadway; or

D. Any or all approaches where engineering judgment determines that high visibility signal backplates are inappropriate.

Standard:

- 21 **Except as provided in Paragraphs 20b and 20c, the inside of signal visors (hoods), the entire surface of louvers and fins, and the front surface of backplates shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background.**

Option:

- ~~22 A yellow retroreflective strip with a minimum width of 1 inch and a maximum width of 3 inches may be placed along the perimeter of the face of a signal backplate to project a rectangular appearance at night.~~

Section 4D.32 Temporary and Portable Traffic Control Signals

Section 4D.32 of the Supplement is modified to insert Paragraph 08 immediately following Paragraph 07 as shown below.

Option:

- 08 High visibility signal backplates (see Section 4D.12 in this Supplement) may be used on temporary and portable traffic control signals.

Section 4I.02 Design of Freeway Entrance Ramp Control Signals

Section 4I.02 of the Supplement is modified to insert Paragraph 02a immediately following Paragraph 02 as shown below.

Standard:

- 02a **High visibility signal backplates shall not be used on freeway entrance ramp control signals.**

Section 4L.01 General Design and Operation of Flashing Beacons

Section 4L.01 of the Supplement is modified to insert Paragraph 02a immediately following Paragraph 02 as shown below.

Standard:

- 02a **Except as provided in Section 4L.02 in this Supplement, high visibility signal backplates shall not be used on flashing beacons.**

Section 4L.02 Intersection Control Beacons

Section 4L.02 of the Supplement is modified to insert Paragraph 10 immediately following Paragraph 09 as shown below.

Option:

- 10 **High visibility signal backplates may be used on intersection control beacons based on the provisions in Section 4D.12 in this Supplement.**

CC:

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Vanloan Nguyen, P.E. – Traffic Engineering Division ADA for Traffic Control Devices

IIM-TE-378 – Attachment A

High Visibility Signal Backplates - Background

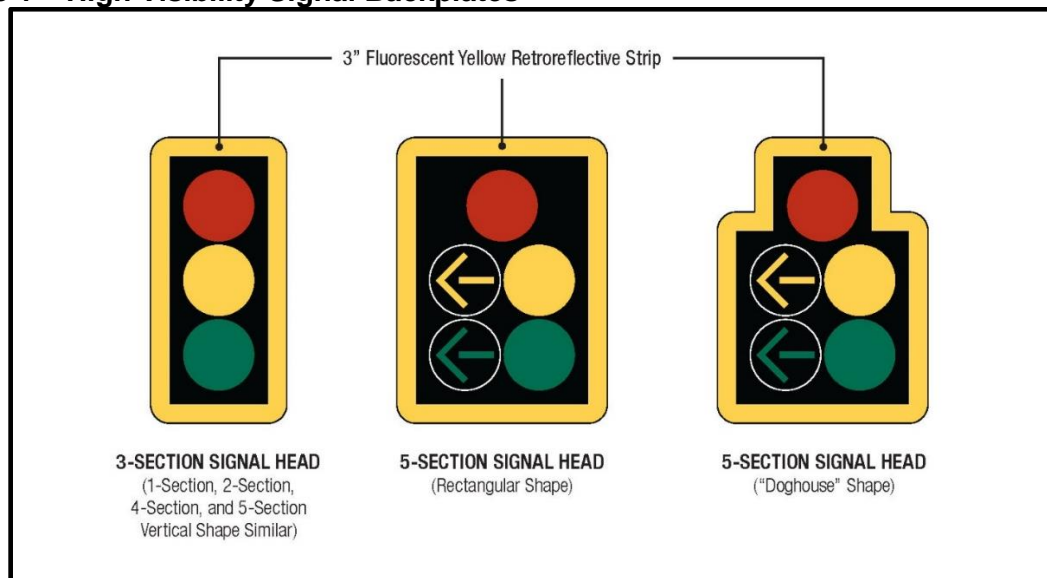
BACKGROUND

HVSBs were approved for use by the Federal Highway Administration in 2004 through Interim Approval IA-1⁴ to the national Manual on Uniform Traffic Control Devices (MUTCD). They are included in the 2009 MUTCD and 2011 Virginia Supplement to the MUTCD (VA Supplement). The MUTCD language allows for the placement of a yellow retroreflective strip with a minimum width of 1 inch and a maximum width of 3 inches along the perimeter of the face of the signal backplate.

In developing HVSB standards, a stakeholder team of representatives from VDOT's signal engineering, maintenance, materials, and safety programs evaluated multiple combinations of backplate materials and reflective sheeting colors and orientation. VDOT consulted manufacturers and other agencies around the country to learn from their experiences to select a product and method for installation. Side-by-side comparisons of backplates with variations in reflective sheeting type, color, width, and location led to the selection of Type XI fluorescent yellow sheeting on the outer 3 inches of the backplate. This selected combination provided noticeable visual benefits more than other options evaluated in daytime, dusk, and nighttime light conditions.

Figure 1 shows HVSB installations on traffic control signals. Additional details related to VDOT required materials and implementation are contained in HVSB Special Provisions.

Figure 1 – High Visibility Signal Backplates



⁴ FHWA's Interim Approval for Retroreflective Backplates can be accessed at the following website:
http://mutcd.fhwa.dot.gov/res-ia_retroborder.htm

IIM-TE-378 – Attachment A

High Visibility Signal Backplates - Background

REFERENCE

- 2009 MUTCD
- 2011 Virginia Supplement to the MUTCD with Revisions
- [Optional Use of Retroreflective Borders on Traffic Signal Backplates](#), FHWA Interim Approval memorandum IA-1, February 6, 2004.
- [Proven Safety Countermeasures - Backplates with Retroreflective Borders](#), FHWA-SA-12-007
- Retroreflective Borders on Traffic Signal Backplates – A South Carolina Success Story <http://safety.fhwa.dot.gov/intersection/resources/casestudies/fhwas09011/>

IIM-TE-378 – Attachment B

High Visibility Signal Backplates - Technical Aspects for Implementation

1.0 GENERAL PROVISIONS FOR HVSBs

HVSBs **may** be used on signal faces at traffic control signals, emergency signals, temporary signals, portable signals, hybrid beacons, and intersection control beacons.

HVSBs **shall not** be used on other highway traffic signals not listed in the prior paragraph.

When it is determined that HVSBs are appropriate on a given intersection approach, all signal faces facing that approach **shall** have HVSBs. It is desirable to use HVSBs on every signal face at that intersection.

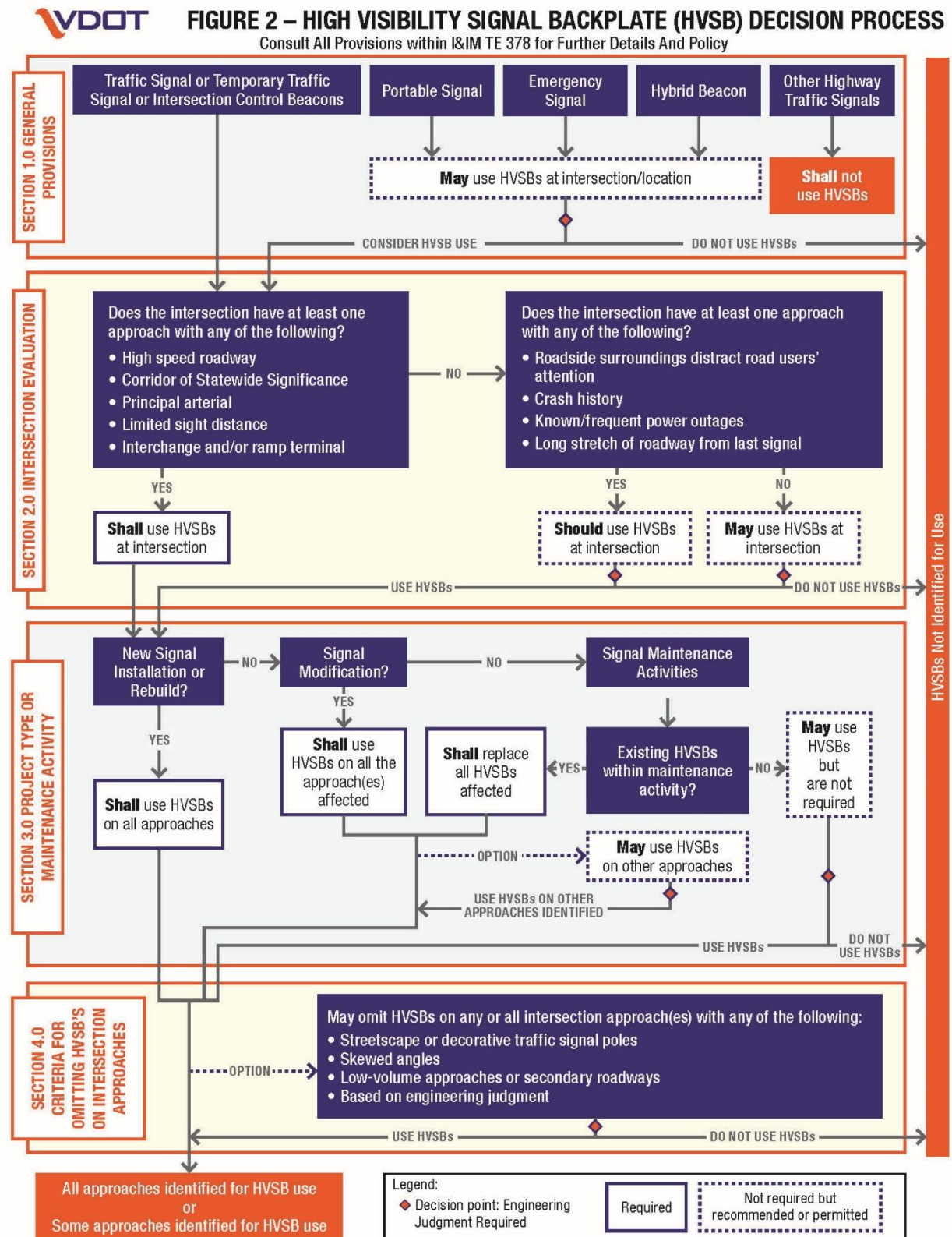
HVSBs **may** be used on signal faces at an individual intersection and not on signal faces at an adjacent intersection(s) along a corridor.

Figure 2 illustrates the HVSB decision process including:

- General provisions (Section 1.0)
- Intersection evaluation for HVSB use (Section 2.0)
- HVSB use by signal project type or maintenance activity (Section 3.0)
- Criteria for omitting HVSBs on intersection approaches (Section 4.0)

IIM-TE-378 – Attachment B

High Visibility Signal Backplates - Technical Aspects for Implementation



IIM-TE-378 – Attachment B

High Visibility Signal Backplates - Technical Aspects for Implementation

2.0 INTERSECTION EVALUATION FOR HVSB USE

This section provides the criteria for evaluating intersections for HVSB use on signal faces at the signal types meeting the criteria contained in Section 1.0.

Except as provided in Section 4.0, HVSBs **shall** be used on signal faces at signalized intersections with at least one approach that has one or more of the following characteristics:

- High speed roadways - where the posted or statutory speed limit or the 85th-percentile speed on an approach to an intersection is 45 mph or greater
- Corridors of Statewide Significance⁵ (CoSS)
- Principal arterials
- Intersections with limited sight distances to the signal face, per Table 4D.12 of the VA Supplement
- Intersections at interchange and/or freeway ramp terminals

Except as provided in Section 4.0, HVSBs **should** be used on signal faces at signalized intersections with at least one approach that has one or more of the following characteristics:

- Where visual roadside clutter or the natural or manmade surroundings would distract road users' attention from the traffic control signal
- Locations where crash history (angle, rear end, or other) or known red light running could be correctable by the installation of HVSBs.
- Locations with known/frequent power outages, especially locations without Uninterruptible Power Supply (UPS)
- Locations that are the first signal encountered after long stretches of roadway without traffic control signals

HVSBs **may** be used at other signalized intersections as determined by engineering judgment.

3.0 HVSB USE BY SIGNAL PROJECT TYPE OR MAINTENANCE ACTIVITY

At intersections that have been identified for HVSB use, HVSBs **shall** be used based on the traffic signal project type or maintenance activity - as follows:

3.1 – New Installations & Rebuilds

For new and rebuilt signals (i.e. full replacement of all signal faces and signal structures), HVSBs **shall** be used on every signal face on all approaches at the intersection.

3.2 – Signal Modifications

For traffic signal modifications that consist of changing or adding at least one overhead signal face (without full replacement of all signal faces and signal structures), HVSBs **shall**

⁵ Corridors of Statewide Significance can be found at the following website:
http://www.vtrans.org/significant_corridors.asp

IIM-TE-378 – Attachment B

High Visibility Signal Backplates - Technical Aspects for Implementation

be used on all the signal faces on the approach(es) affected by the modification. HVSBs **may** also be used on all the signal faces on the approach(es) not affected by the modification(s).

The provisions contained in Section 3.4 **shall** apply when modifying signal structures, including retrofitting existing signal faces with HVSBs as part of a traffic signal modification.

3.3 – Signal Maintenance Activities

If HVSBs have already been installed at an intersection, HVSBs **shall** be replaced if the maintenance activity involves a replacement or change of a signal face and/or backplate.

HVSBs **may** be used at an intersection where they do not currently exist as part of preventative, routine, or responsive traffic signal maintenance activities, subject to the provisions contained in Section 1.0.

HVSB use **may** be omitted when traffic signal modifications are made during responsive maintenance completed under the direction of the Regional Operations Maintenance Manager.

The provisions contained in Section 3.4 **shall** apply for retrofitting existing traffic signals for HVSBs as part of traffic signal maintenance activities.

HVSBs use as part of signal maintenance activities following the policies and standards established in this memorandum shall not require sealing and signing per Traffic Engineering Division Memorandum TE-362.1.

3.4 – Modification of Existing Signal Structures & Retrofitting Existing Signals for HVSBs

Modifications to existing signal structures shall be in accordance with the procedures outlined in the Structure & Bridge Division/Traffic Engineering Division Instructional & Informational Memorandum IIM-S&B-82/TED-357.

Retrofitting existing signals with HVSBs involves the replacement of an existing black backplate with a new HVSB. The existing signal face may be retained or replaced as part of the retrofit.

Retrofit of an existing backplate with a HVSB is not considered a modification and is not subject to the procedures in IIM-S&B-82/TED-357 provided that for a given signal structure:

1. Each HVSB is the same size as or smaller than the existing backplate being replaced;
and
2. A) The proposed HVSB material(s) (excluding the retroreflective strip) and the signal face (if applicable) are the same materials as the existing;
or
B) The weight of the proposed HVSB(s) and the signal face (if applicable) is equal to or less than the weight of the existing signal face and backplate.

IIM-TE-378 – Attachment B

High Visibility Signal Backplates - Technical Aspects for Implementation

4.0 CRITERIA FOR OMITTING HVSBs ON INTERSECTION APPROACHES

Once an intersection or approach has been identified for HVSB use, HVSBs **may** be omitted on any intersection approach that has one or more of the following characteristics:

- Streetscape corridors or locations with decorative traffic signal poles
- Skewed angles where HVSBs could inadvertently provide unwanted visibility for the wrong approach
- Low-volume approaches, such as low-volume commercial entrances and private entrances (see Road Design Manual Appendix F for definitions), or secondary roadways
- Any or all approach(es) where engineering judgment determines that HVSBs are inappropriate

Section 4D.12 Visibility, Aiming, and Shielding of Signal Faces

Standard:

- 01 The primary consideration in signal face placement, aiming, and adjustment shall be to optimize the visibility of signal indications to approaching traffic.
- 02 Road users approaching a signalized intersection or other signalized area, such as a midblock crosswalk, shall be given a clear and unmistakable indication of their right-of-way assignment.
- 03 The geometry of each intersection to be signalized, including vertical grades, horizontal curves, and obstructions as well as the lateral and vertical angles of sight toward a signal face, as determined by typical driver-eye position, shall be considered in determining the vertical, longitudinal, and lateral position of the signal face.

Guidance:

- 04 *The two primary signal faces required as a minimum for each approach should be continuously visible to traffic approaching the traffic control signal, from a point at least the minimum sight distance provided in Table 4D-2 in advance of and measured to the stop line. This range of continuous visibility should be provided unless precluded by a physical obstruction or unless another signalized location is within this range.*
- 05 *There should be legal authority to prohibit the display of any unauthorized sign, signal, marking, or device that interferes with the effectiveness of any official traffic control device (see Section 11-205 of the "Uniform Vehicle Code").*
- 06 *At signalized midblock crosswalks, at least one of the signal faces should be over the traveled way for each approach.*

Table 4D-2. Minimum Sight Distance for Signal Visibility

85th-Percentile Speed	Minimum Sight Distance
20 mph	175 feet
25 mph	215 feet
30 mph	270 feet
35 mph	325 feet
40 mph	390 feet
45 mph	460 feet
50 mph	540 feet
55 mph	625 feet
60 mph	715 feet

Note: Distances in this table are derived from stopping sight distance plus an assumed queue length for shorter cycle lengths (60 to 75 seconds).

IIM-TE-378 – Attachment C
Virginia Supplement to the MUTCD, Revision 1 - Section 4D.12

Standard:

- 07 **If approaching traffic does not have a continuous view of at least two signal faces for at least the minimum sight distance shown in Table 4D-2, a sign (see [Section 2C.36 of the MUTCD](#)) shall be installed to warn approaching traffic of the traffic control signal.**

Option:

- 08 If a sign is installed to warn approaching road users of the traffic control signal, the sign may be supplemented by a Warning Beacon (see [Section 4L.03 of the MUTCD](#)).
- 09 A Warning Beacon used in this manner may be interconnected with the traffic signal controller assembly in such a manner as to flash yellow during the period when road users passing this beacon at the legal speed for the roadway might encounter a red signal indication (or a queue resulting from the display of the red signal indication) upon arrival at the signalized location.
- 10 If the sight distance to the signal faces for an approach is limited by horizontal or vertical alignment, supplemental signal faces aimed at a point on the approach at which the signal indications first become visible may be used.

Guidance:

- 11 *Supplemental signal faces should be used if engineering judgment has shown that they are needed to achieve intersection visibility both in advance and immediately before the signalized location.*
- 12 *If supplemental signal faces are used, they should be located to provide optimum visibility for the movement to be controlled.*

Standard:

- 13 **In cases where irregular street design necessitates placing signal faces for different street approaches with a comparatively small angle between their respective signal indications, each signal indication shall, to the extent practical, be visibility-limited by signal visors, signal louvers, or other means so that an approaching road user's view of the signal indication(s) controlling movements on other approaches is minimized.**
- 14 **Signal visors exceeding 12 inches in length shall not be used on free-swinging signal faces.**

Guidance:

- 15 *Signal visors should be used on signal faces to aid in directing the signal indication specifically to approaching traffic, as well as to reduce "sun phantom," which can result when external light enters the lens.*
- 16 *The use of signal visors, or the use of signal faces or devices that direct the light without a reduction in intensity, should be considered as an alternative to signal louvers because of the reduction in light output caused by signal louvers.*

Option:

- 17 Special signal faces, such as visibility-limited signal faces, may be used such that the road user does not see signal indications intended for other approaches before seeing the signal indications for their own approach, if simultaneous viewing of both signal indications could cause the road user to be misdirected.

IIM-TE-378 – Attachment C

Virginia Supplement to the MUTCD, Revision 1 - Section 4D.12



Guidance:

- 18 *Signal backplates should be installed on all signal faces.*

Standard:

- 19 **Backplates shall be installed on signal faces if at least one of the following is true: the posted or statutory speed limit or the 85th-percentile speed on an approach to a signalized location is 45 mph or higher, sun glare or bright sky is frequent, or where complex or confusing backgrounds indicate a need for enhanced signal face target value.**

Support:

- 20 The use of backplates enhances the contrast between the traffic signal indications and their surroundings for both day and night conditions, which is also helpful to older drivers.



Support:

- 20a High visibility signal backplates are backplates with retroreflective borders that provide enhanced signal visibility by:

- Introducing retroreflective material that contrasts against the dark backplate,
- Distinguishing the signal face assembly from background lighting, signs, and visual distractions,
- Increasing signal face recognition during power outages and times of limited visibility (e.g. night, fog, heavy precipitation), and
- Drawing attention to the intersection and signals after a long roadway section without signals.

Option:

- 20b High visibility signal backplates may be used on traffic control signals.

Standard:

- 20c **If used, high visibility signal backplates shall consist of a 3-inch wide fluorescent yellow retroreflective strip along the outermost perimeter of the front face of a signal backplate.**

Support:

- 20d If used, it is desirable to install high visibility signal backplates on every signal face at the intersection.

Standard:

- 20e **If used on an approach, high visibility signal backplates shall be used on all signal faces facing that approach.**

Option:

- 20f High visibility signal backplates may be used on signal faces at an individual intersection and not at an adjacent intersection(s) along a corridor.

IIM-TE-378 – Attachment C

Virginia Supplement to the MUTCD, Revision 1 - Section 4D.12

Standard:

20g **Except as provided in Paragraph 20i, high visibility signal backplates shall be used on signal faces at signalized intersections with at least one approach that has one or more of the following characteristics:**

- F. High speed roadway - where the posted or statutory speed limit or the 85th-percentile speed on an approach is 45 mph or greater;**
- G. Corridor of Statewide Significance (CoSS);**
- H. Principal arterial;**
- I. Intersections with limited sight distances to the signal face, per Table 4D.12 in this Supplement; or**
- J. Intersection at interchange and/or freeway ramp terminals.**

Guidance:

20h *Except as provided in Paragraph 20i, high visibility signal backplates should be used on signal faces at signalized intersections with at least one approach that has one or more of the following characteristics:*

- E. Where visual roadside clutter or the natural or manmade surroundings would distract road users' attention from the traffic control signal;*
- F. Where crash history (angle, rear end, or other) or known red light running could be correctable by the installation of high visibility signal backplates;*
- G. Is located in an area with known or frequent power outages, especially at locations without an Uninterruptible Power Supply (UPS); or*
- H. A location that is the first signal encountered after a long section of roadway without traffic control signals.*

Option:

20i **Once an intersection or approach has been identified for high visibility signal backplate use, high visibility signal backplates may be omitted on any intersection approach that has one or more of the following characteristics:**

- E. Streetscape corridor or location with decorative traffic signal poles;**
- F. Skewed angles where high visibility signal backplates could inadvertently provide unwanted visibility for the wrong approach;**
- G. Low-volume approach, such as a low-volume commercial entrance or private entrance (see Road Design Manual Appendix F for definitions), or secondary roadway; or**
- H. Any or all approaches where engineering judgment determines that high visibility signal backplates are inappropriate.**

Standard:

21 **Except as provided in Paragraphs 20b and 20c, the inside of signal visors (hoods), the entire surface of louvers and fins, and the front surface of backplates shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background.**



Section 4D.32 Temporary and Portable Traffic Control Signals

Support:

- 01 A temporary traffic control signal is generally installed using methods that minimize the costs of installation, relocation, and/or removal. Typical temporary traffic control signals are for specific purposes, such as for one-lane, two-way facilities in temporary traffic control zones (see [Chapter 4H of the MUTCD](#)), for a haul-road intersection, or for access to a site that will have a permanent access point developed at another location in the near future.

Standard:

- 02 **Advance signing shall be used when employing a temporary traffic control signal.**
- 03 **A temporary traffic control signal shall:**
- A. **Meet the physical display and operational requirements of a conventional traffic control signal.**
 - B. **Be removed when no longer needed.**
 - C. **Be placed in the flashing mode when not being used if it will be operated in the steady mode within 5 working days; otherwise, it shall be removed.**
 - D. **Be placed in the flashing mode during periods when it is not desirable to operate the signal, or the signal heads shall be covered, turned, or taken down to indicate that the signal is not in operation.**

Guidance:

- 04 *A temporary traffic control signal should be used only if engineering judgment indicates that installing the signal will improve the overall safety and/or operation of the location.*
- 05 *The use of temporary traffic control signals by a work crew on a regular basis in their work area should be subject to the approval of the jurisdiction having authority over the roadway.*
- 06 *A temporary traffic control signal should not operate longer than 30 days unless associated with a longer-term temporary traffic control zone project.*
- 07 *For use of temporary traffic control signals in temporary traffic control zones, reference should be made to [the Virginia Work Area Protection Manual](#).*


Option:

- 08 [High visibility signal backplates \(see Section 4D.12 in this Supplement\) may be used on temporary and portable traffic control signals.](#)



Section 4I.02 Design of Freeway Entrance Ramp Control Signals

Standard:

- 
- 01 Ramp control signals shall meet all of the standard design specifications for traffic control signals, except as otherwise provided in this Section.
 - 02 The signal face for freeway entrance ramp control signals shall be either a two-section signal face containing red and green signal indications or a three-section signal face containing red, yellow, and green signal indications.
 - 02a **High visibility signal backplates shall not be used on freeway entrance ramp control signals.**
 - 03 If only one lane is present on an entrance ramp or if more than one lane is present on an entrance ramp and the ramp control signals are operated such that green signal indications are always displayed simultaneously to all of the lanes on the ramp, then a minimum of two signal faces per ramp shall face entering traffic.
 - 04 If more than one lane is present on an entrance ramp and the ramp control signals are operated such that green signal indications are not always displayed simultaneously to all of the lanes on the ramp, then one signal face shall be provided over the approximate center of each separately-controlled lane.

Guidance:

- 05 *Additional side-mounted signal faces should be considered for ramps with two or more separately-controlled lanes.*

Standard:

- 06 Ramp control signals shall be located and designed to minimize their viewing by mainline freeway traffic.

Option:

- 07 Ramp control signals may be placed in the dark mode (no indications displayed) when not in use.
- 08 Ramp control signals may be used to control some, but not all, lanes on a ramp, such as when non-metered HOV bypass lanes are provided on a ramp.
- 09 The required signal faces, if located at the side of the ramp roadway, may be mounted such that the height above the pavement grade at the center of the ramp roadway to the bottom of the signal housing of the lowest signal face is between 4.5 and 6 feet.
- 10 For entrance ramps with only one controlled lane, the two required signal faces may both be mounted at the side of the roadway on a single pole, with one face at the normal mounting height and one face mounted lower as provided in Paragraph 9, as a specific exception to the normal 8-foot minimum lateral separation of signal faces required by [Section 4D.13 of the MUTCD](#).

IIM-TE-378 – Attachment E

Virginia Supplement to the MUTCD, Revision 1 - Section 4I.02

Guidance:

- 11 *Regulatory signs with legends appropriate to the control, such as XX Vehicle(S) Per Green or XX VEHICLE(S) PER GREEN Each Lane (see [Section 2B.56 of the MUTCD](#)), should be installed adjacent to the ramp control signal faces. When ramp control signals are installed on a freeway-to-freeway ramp, special consideration should be given to assuring adequate visibility of the ramp control signals, and multiple advance warning signs with flashing warning beacons should be installed to warn road users of the metered operation.*

Section 4L.01 General Design and Operation of Flashing Beacons

Support:

- 01 A Flashing Beacon is a highway traffic signal with one or more signal sections that operates in a flashing mode. It can provide traffic control when used as an intersection control beacon (see [Section 4L.02 in this Supplement](#)) or it can provide warning when used in other applications (see [Sections 4L.03, 4L.04, and 4L.05 of the MUTCD](#)).

Standard:

- 02 Flashing Beacon units and their mountings shall comply with the provisions of Chapter 4D, except as otherwise provided in this Chapter.
- 02a **Except as provided in Section 4L.02 in this Supplement, high visibility signal backplates shall not be used on flashing beacons.**
- 03 Beacons shall be flashed at a rate of not less than 50 or more than 60 times per minute. The illuminated period of each flash shall be a minimum of 1/2 and a maximum of 2/3 of the total cycle.
- 04 A beacon shall not be included within the border of a sign except for School Speed Limit Sign Beacons (see [Sections 4L.04 and 7B.15 of the MUTCD](#)).

Guidance:

- 05 *If used to supplement a warning or regulatory sign, the edge of the beacon signal housing should normally be located no closer than 12 inches outside of the nearest edge of the sign.*

Option:

- 06 An automatic dimming device may be used to reduce the brilliance of flashing yellow signal indications during night operation.



Section 4L.02 Intersection Control Beacons

Standard:

- 01 An Intersection Control Beacon shall consist of one or more signal faces directed toward each approach to an intersection. Each signal face shall consist of one or more signal sections of a standard traffic signal face, with flashing CIRCULAR YELLOW or CIRCULAR RED signal indications in each signal face. They shall be installed and used only at an intersection to control two or more directions of travel.
- 02 Application of Intersection Control Beacon signal indications shall be limited to the following:
 - A. Yellow on one route (normally the major street) and red for the remaining approaches, and
 - B. Red for all approaches (if the warrant described in [Section 2B.07 of the MUTCD](#) for a multi-way stop is satisfied).
- 03 Flashing yellow signal indications shall not face conflicting vehicular approaches.
- 04 A STOP sign shall be used on approaches to which a flashing red signal indication is displayed on an Intersection Control Beacon (see [Section 2B.04 of the MUTCD](#)).
- 05 If two horizontally aligned red signal indications are used on an approach for an Intersection Control Beacon, they shall be flashed simultaneously to avoid being confused with grade crossing flashing-light signals. If two vertically aligned red signal indications are used on an approach for an Intersection Control Beacon, they shall be flashed alternately.

Guidance:

- 06 *An Intersection Control Beacon should not be mounted on a pedestal in the roadway unless the pedestal is within the confines of a traffic or pedestrian island.*

Option:

- 07 Supplemental signal indications may be used on one or more approaches in order to provide adequate visibility to approaching road users.
- 08 Intersection Control Beacons may be used at intersections where traffic or physical conditions do not justify conventional traffic control signals but crash rates indicate the possibility of a special need.
- 09 An Intersection Control Beacon is generally located over the center of an intersection; however, it may be used at other suitable locations.

Option:

- 10 High visibility signal backplates may be used on intersection control beacons based on the provisions in [Section 4D.12](#) in this Supplement.

